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SOME POSSIBLE IMPLICATIONS OF PSYCHOLOGICAL PERFORMANCE FOR LINGUISTIC RULES.

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THIS PAPER IS AN EXPLORATION OF THE DEGREE TO WHICH THE COGNITIVE CAPACITIES OF HUMAN BEINGS, AS DELINEATED BY PSYCHOLOGY, ARE SEEN TO BE CONGRUENT WITH THE FINDINGS OF LINGUISTIC RESEARCH, AND SOME SPECULATIONS ABOUT THE POSSIBLE IMPLICATIONS FOR LINGUISTIC RULES THAT MAY BE DISCOVERED THROUGH AN EXAMINATION OF PSYCHOLOGICAL PERFORMANCE. IT IS SHOWN THAT THREE KINDS OF BEHAVIOR WHICH ARE IMPORTANT AND CHARACTERISTIC OF HUMAN BEINGS ARE FAITHFULLY REFLECTED IN LANGUAGE UNIVERSALS, I.E., THE "I-OTHER" DISTINCTION, ANALOGIZING AND EXTRAPOLATING FROM EVENT TO OTHERS, AND THE NATURE OF OUR PERCEPTIONS OF PHYSICAL SIGNALS FROM THE REAL WORLD. IT IS SUGGESTED THAT THE NATURE OF HUMAN INTELLECTUAL CAPACITIES MAY IMPLY CERTAIN KINDS OF CONSTRAINTS ON STATEMENTS OF STRUCTURAL AND GENERATIVE RULES WHICH CAN PROFITABLY BE ATTRIBUTED TO A LANGUAGE. EVIDENCE IS PRESENTED THAT SUPPORTS THE NOTION THAT WE MAKE SIMULTANEOUS GRAMMATICAL, SEMANTIC, AND PHONOLOGICAL DECISIONS DURING ENCODING AND DECODING OPERATIONS, AND THAT DECISIONS ON ANY ONE LEVEL APPEAR TO INFLUENCE THOSE ON THE OTHERS. THIS PAPER WAS PRESENTED AT THE MEETING OF THE UNIVERSITY OF MICHIGAN LINGUISTICS CLUB, ANN ARBOR, MARCH 16, 1967, AND ALSO APPEARS IN "STUDIES IN LANGUAGE AND LANGUAGE BEHAVIOR, PROGRESS REPORT V," SEPTEMBER 1, 1967. (AUTHOR/AMM)

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Some Possible Implications of Psychological Performance for Linguistic Rules[1, 2]

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The paper is an exploration of the degree to which the cognitive capacities of human beings, as delineated by psychology, are seen to be congruent with the findings of linguistic research, and some speculations about the possible implications for linguistic rules that may be discovered through an examination of psychological performance. It is shown that 3 kinds of behavior which are important and characteristic of human beings are faithfully reflected in language universals, i.e., the "I-other" distinction, analogizing and extrapolating from one event to others, and the nature of our perceptions of physical signals from the real world. It is suggested that the nature of human intellectual capacities may imply certain kinds of constraints on statements of structural and generative rules which can profitably be attributed to a language. Evidence is presented that supports the notion that we make simultaneous grammatical, semantic, and phonological decisions during encoding and decoding operations, and that decisions on any one level appear to influence those on the others.

Some time ago I became interested in the apparently increasing convergence of the concerns of linguistics and psychology. That the two disciplines <u>are</u> converging is evidenced in a very official way by the establishment on the campus of the University of Michigan of the first graduate program in psycholinguistics--a joint venture of the Linguistics and Psychology Departments. Eventually, I began to ask myself <u>why</u> this conjunction seems to be taking place.

It seems reasonable that a product that is so uniquely human as language must inevitably reflect the extent and limits of our capacities for thinking, concept formation, problem-solving, rule-generation and application, and creativity--all topics dear to the heart of the psychologist--and, it happens, very relevant to linguistic behavior. That is, we might ask whether psychological conceptions of human nature can account for the complex activities involved in speaking and understanding natural languages. Phenomena for which there are no adequate explanatory psychological principles, but which are manifested in features that are widely shared among the languages of the world could indicate potentially fruitful areas for psychological theory and research. Similarly, well-established

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psychological concepts may provide profitable leads as to the nature of the rules which are at the heart of any language.

First, I would like to informally test the notion that symbolic activities that are clearly within the capacities of human beings are manifested in language universals, and that performances which are beyond human capacities (to the best of psychology's knowledge) are not found in any natural language. Then I would like to explore some kinds of psychological phenomena that may have some implications for linguistics.

The first question may be grossly phrased as follows: Are linguistic universals congruent with what we know about psychological competence as independently assessed? In reflecting on this question at least three kinds of psychological phenomena can be considered relevant. The first is the observation that the differentiation between "me" and "not-me" is of basic and continuous importance in human functioning. The newborn infant does not make this distinction, though it develops rapidly in its grossest physical form. Indeed, this differentiation is dictated by the functional need for effective interaction with the external world. The well-known "thoughtlessness" of a child is a case in point--how, when his attention is focused on a rolling ball, he will follow it out into a busy street, without glancing up to see what other objects, e.g., automobiles, in the vicinity are doing. Likewise, the spoiled child has not learned that the world is not his oyster--that other people have needs, rights, and desires which may be in conflict with his. Each of us develops a concept of self, independent of, but related to, others--a process that can be seen in the struggles of adolescence. It is little wonder, then, that all languages possess "substitution" elements--elements whose denotations depend on features of the environmental language situation. In English, these include personal, demonstrative and relative pronouns. And among these "deictic" elements is always one that denotes the speaker and one that denotes the addressee. Thus, a basic psychological fact is mirrored in the nature of the symbolic systems with which we confront the world.

Another such instance is that in many areas of activity, human beings demonstrate the capacity to respond to new stimuli in terms of their partial similarity to combinations of old categories. For example, when Ss are shown two quite distinct pictures for very brief exposures, in such a way that each eye only sees one picture, they report an image which is most often a combination of the

features of the two. Perhaps more persuasive is the fact that you can write your name backwards with your non-preferred hand--even though you probably never have. Or consider the truly fantastic performance of an end on a football team when he correctly anticipates the exact point at which a thrown ball will come within his reach. He probably never faces exactly the same set of conditions twice, but he regularly combines elements of past experience, extrapolates from them, and catches the ball for a touchdown. I suggest that there is a real transformation for you. We can see this same quality of performance in a second universal feature of languages--that of "openness." Hockett puts it in these terms:

> New messages are freely coined by blending, analogizing from, and transforming old ones. Old or new elements are freely assigned new semantic loads by circumstances and context [1963, p. 9].

Again, we have a psychological capacity manifested in a widespread feature of natural languages.

A third crucial aspects of psychological capacity is our ability to make extremely accurate judgments of "same-different," but very poor ones in terms of absolute values. That is, our sensory apparatus appears to be uniquely built to identify differences, or changes. To cite an illustration: in discrimination experiments in color, human beings can distinguish between more than 7,000,000 different colors--so long as they are presented two at a time and judgments are in terms of "same-different." On the other hand, we can identify only 12-13 different colors when they are presented singly. So we are well-equipped to make exactly the kinds of judgments called for in much of linguistic research. Furthermore, it is characteristic of human performance, in the face of continuous changes along some stimulus dimension, to identify a series of stimuli as "the same" and to change abruptly to an adjacent category when some threshold value is reached. Again colors are a good case in point. For any given individual, a certain band of the spectrum is "red" and at some point, there is a sharp change to "orange," or "reddish-orange," or "sunkissed peach" or some such term. It is important to note that the boundary between these categories of hue is a sharp one--not gradual. You might observe that within the "red" band, there are many colors which the S can tell apart, but they are all "allo-reds" so far as his identification is concerned. This phenomenon can be related to the universal language feature that is termed "discreteness."

Hockett puts it this way: "Any utterance in a language must differ from any other utterance of the same length by at least one whole phonological feature [1963, p. 8]." It seems that the psychological characteristic of treating a range of stimuli that can be discriminated by our sensory machinery, as "the same," and treating anything beyond some arbitrary point as "different," very neatly maps onto the linguistic feature of "discreteness," and thus enables us to treat the enormous range of variations in, say, high front vowels as either /i/ or /I/, as though there were no overlapping characteristics between them.

Let us now take a brief look at the obverse situation. Are there performances which, so far as psychology has been able to identify them, are beyond the capacity of human beings but which (perversely) show up as design features of any known language? I could find none. Two examples will suffice. The human vocal mechanism is so built that there cannot be simultaneous voicing and glottal closure; hence there are no voiced glottal stops. But consider a more significant and less obvious example. The information processing capacities of human beings are quite stable and well-identified. Many experiments have shown that we can process only about 40 bits of information per second, and a symbol system with less than 50% redundancy would be simply too much for us. Although computer languages can easily be designed to have much greater efficiency than natural languages, they are of little use for communications between people. Our cognitive capacity effectively puts a lower limit on the redundancy levels of spoken language. It is interesting to note then, that Hockett, among others, has observed that there is no language with a redundancy level significantly below 50%.

It might be objected that the recursive features of language permit the generation of extremely complex and long verbal strings--far beyond the capacity of a human being to process them, comprehend them, reply to them, or respond to them in any adaptive way, but which still faithfully reflect the rules of the system. This is not evidence that disconfirms what has gone before. The <u>feature</u> of recursiveness is quite sound psychologically, but almost any phenomenon can be extrapolated beyond the limits of our capacity to deal with it. Problems can be made so difficult that they are insoluble, strings of words can be made so long that we cannot recall them, physical objects in the environment can be made to move so fast that we cannot see the movement, differences in pitch can be made

so small that we cannot detect them, and so on. So the observation is not about the feature of recursiveness, but about the way it is stated. Since natural languages were evolved by human beings for communcating with each other, perhaps infinite recursiveness is not a necessary feature of language.

Under these conditions, it is tempting to speculate that universal language rules map onto what we know about basic psychological capacities with surprising fidelity. If this guess is supported by further investigation, the appearance of what seem to be significant incongruencies may serve heuristic functions for both linguists and psychologists. Likewise, perhaps statements of the limits and the nature of psychological competence have implications for linguistic rules.

Going beyond the information given is pandemic to human cognitive activity. Upon the basis of relatively few experiences with a population of stimuli, we begin generalizing, hypothesizing rules and theories, and our behavior thereafter is directed by those rules. Furthermore, in the course of their categorizing and classifying, human beings always select those aspects of experience to which they will attend. The problem of this selection of stimuli is an interesting one, and several factors are involved. In the first place, some events in our environment are somehow more important to us than others, that is, they serve as foci around which we weave other considerations. This is shown in the great efforts directed towards a search for linguistic universals. Undoubtedly there is something characteristically human that will give rise to the development of distinctions between events which a large number of languages encode for instance as noun phrases as against those encoded as verb phrases.

A more specific instance of this differential importance of aspects of experience is reflected in Jesperson's idea of ranks (1933). He offers the suggestion that in any multi-word designation of events or persons there is one word or group of first importance, which is defined, qualified, or modified by another word, which in turn is modified by still another. He called the first a "primary" and the others "secondaries" and "tertiaries." An example would be the phrase "extremely hot weather," in which of course weather is a primary, hot is a secondary, and extremely is a tertiary. It should be borne in mind that Jesperson is not talking about parts of speech as such, since he goes on to demonstrate that adjectives can be primaries by this definition as in the sentence, "One must bow to the inevitable," or "Let the dead bury their dead."

Analogously, nouns show up as secondaries in many instances, such as "cannon-ball," "storefront," "treeline," or "wavewashed." Jesperson goes on to a discussion of ranks of words within phrases, of phrases within clauses, and clauses within sentences--almost it seems, in terms of a kind of immediate constituent analysis. The second factor that seems to be involved in the selection of environmental or linguistic events to which we will respond is the finite limit of human information processing mechanisms referred to earlier. This is really a protective device for us since we are not capable of dealing with the enormous mass of potential stimuli that impinge upon our sensory receptors at any given moment. It is thus functionally important for us to be able to tune out unwanted aspects. A good and common illustration is the cocktail party problem. Usually by the second hour of the cocktail party the hubbub is something terrific, and yet, by simply concentrating our attention, we can follow a specific conversation, filtering out the remaining noises. Another example of our tendency to respond to only certain aspects of the environment is the attention that English speakers give to the word order of utterances, while ignoring absolute tone levels. Of course if they were speaking Chinese they would not be able to do this. Similarly the native Russian speaker is less concerned with word order, but he is very alert to inflectional endings of words. Psychiatrists, furthermore, often devote a lot of their attention to supra-segmentals, since these signals often tell them more about what they need to know than do lexical items themselves.

Miller (1956), who has done a great deal of work in language behavior, has dealt with the upper limits of our capacity to make simultaneous discriminations. It has been shown in many experiments that we can accurately identify something like one out of 10 or 15 different equally likely alternatives at a given time. The example with colors was cited earlier. If we had to make simultaneous discriminations on all 11 of Halle's distinctive features, for example, this would require a command of 22 categories, since each feature has two values. How do we, and our language, solve this problem? There are two avenues that suggest themselves. Our language can contain enough redundancy that one is given enough time to process all this information in stages, or the design of the language can simply not require this number of discriminations at any given time. Both devices are used, of course--not only in language

structure but in phonology as well. A linguistics graduate student undertook to find pairs of English words which would differ by 1, 2, 3, and so on up to all 11 distinctive features. He could find pairs only up to 5 features apart and none greater. An explanation of this result is to be found in the fact that such pairs approach the limit of human capacity to make discriminations between them. Two English words which differed by say, 9 features, would be of little use to us communicatively, since we could hardly process so much information at any one time. It is probable that other natural languages demonstrate similar characteristics. As a result of our necessity for protecting our internal cognitive circuits there is a tendency for human beings, either as producer or receiver of language, to reduce this high in-put rate by condensation, abbreviation, and the sampling of the total signal. In other words we try to make things as simple as possible for ourselves. In so doing, we seem to use as little of the total signal as will meet the needs of the moment. Furthermore, those dimensions we elect to use are those we have found in the past to be most reliable. In psychology, this is called the Law of Least Effort. We could do the same thing in language production and language reception.

In essence, I am suggesting a compensatory model of linguistic functioning. It is almost as though the language user continually asks himself what <u>part</u> of the total apparatus he needs to use or what aspects of the incoming signal are most relevant at the moment. This strategy seems quite understandable in the light of our previous observations about our finite information processing capacities. This compensatory model shows up in ordinary speech where we begin an utterance, often with virtually no planning of what we are going to say. Under these circumstances, we seem to sense the direction that the remark is going, and, if that is not the direction intended, we change the <u>remainder</u> to achieve the overall effect desired. This does not imply a finite state grammar. Otherwise there would never be a need for constant adaptation to some even dimly anticipated goal, since we would never know what we meant until after we had said it. It <u>does</u> imply that perhaps grammatical, semantic and phonological decisions are made concurrently, and, if this is so, they may well affect each other. It seems to me that a natural language is such an entity and the relations between its parts so intimate that it is not unreasonable to expect that

characteristics of one dimension, for example, semantics, may well specify accommodation or "conditioning" by another, such as phonology or grammar. Perhaps, then, conditioning, when it occurs, may not always function within a single system, but there may be cross-system conditioning which can be initiated--so to speak--from any one of the three.

If the idea of a compensatory--somewhat hydraulic--model for the language user has any validity it may have implications for the type of description that most adequately accounts for the facts of the language. This point can be illustrated with two examples. The first involves an experiment performed by Dr. Walter Stolz while at the Center for Cognitive Studies at Harvard. He was studying the ability of college students to decode multiple embedded constructions under optimal conditions. They were presented with written sentences with second relative clauses embedded inside the first, and allowed unlimited time to rewrite them as a series of simple sentences--one for each clause in the original sentence.

Three types of embedded sentences were used:

1. Those in which semantic constraints precluded any syntactic interpretation other than the correct one, e.g., The porcelain vase that the maid that the agency hired dropped broke on the floor.

2. Those in which the same words could be combined in several different ways, e.g., The man that the boy that the woman saw heard met the girl.

3. Those in which the words could be combined into grammatically acceptable sentences, but in fact, if the syntax were correctly interpreted, the sentence was semantically anomolous, e.g., The stone that the boy that the club members threw hit blackballed the window.

Stolz found that 88% of college student Ss could recode the type 1 sentence, 70% could handle types 1 and 2, while only 55% could handle all three. In other words, 30% of the Ss could not unscramble the syntactic structure when semantic cues were noncommital. This may raise questions about whether the relative clause embedding rule is completely recursive, as it has been assumed to be for native speakers of English. In addition, these results raise the question of the extent to which these complex grammatical rules can be dealt with independent of semantic considerations. Recall that almost one half of these Ss were unable to identify the relationships between various parts of the sentence when they violated semantic constraints.

Stolz tried to account for this result by supposing that the recursive rule was a part of the linguistic competence of all native speakers of English and that some psychological factor was operating to prevent his Ss from unscrambling the embedded sentences on structural grounds. Time pressure and memory load were certainly not the culprits because unlimited time was available and the sentences were in written form. He was unsuccessful in discovering any other reasonable psychological explanation. He then turned to an alternative interpretation of the results--that the recursive rule is part of the competence of some people but not of others. Various indirect bits of evidence led him to the conclusion that this may indeed be the case. Apparently, the recursive rule is learned as a separate device in the various situations to which it is applicable, and about one third of his Ss had not learned it in ways that would enable them to perform the task he set them.

On the other hand observe the possible operation of the previously suggested multi-systemic, compensatory model. Is it not possible that, in this kind of complex situation, the law of least effort comes into play and, since semantic relations between the subjects, verbs, and objects in these relative clauses are customarily simpler than are the grammatical relations involved, we tend to trust them and not to learn to handle the structural relations present? It would not be surprising if Ss could decode single embedded sentences--even where semantic cues were non-commital or anomalous, and thus operated on the basis of syntactical relations. But it is expected that they would shift to the simpler, more (usually) reliable level of semantic cues when the grammatical going got rough.

Some recently collected data bears on this same point. A group of Ss was presented with written passages of prose from which paragraph indentions and sentence punctuation had been removed. Their task was to indicate where sentence junctures should go. Each S performed on the passage in ordinary English and another in "nonsense"--meaning that all nouns, verbs, adjectives, and adverbs had been replaced with nonsense words. The result was a fairly meaningless string which still retained the appropriate grammatical endings on words and all the function words. Here is a brief sample, "Creetamals yet know ciemmal krenon can sreen with his dones to a deuwt for more than a tamidarably lonz thag like a piesbone before archment...." In short, most formal markers of

sentence structure were still present, but semantic cues were severely restricted. Data have not been completely tabulated yet, but preliminary indications are that Ss show a high degree of agreement in placing sentence punctuation in the English passage but there is considerable deterioration when they tackle nonsense. Their behavior becomes much more variable and they begin putting periods in some very strange places indeed. There was no time pressure but they seemed to have difficulty finding structures without semantic cues. It makes me wonder if we adequately state the case when we assert that "form underlies meaning." Perhaps there is a significant interaction going on or maybe form only underlies certain kinds of meaning. Maybe we should replace our Monroe Doctrine kind of stance with an Alliance for Progress.

The second illustration is based on an article by Richard Gunter on the placement of accent in dialogue. Gunter argues for a context theory of grammar, because only through the use of some such device can one explain the intonation contours of sentences in a simple dialogue. His analysis is very much in harmony with the position taken in this paper. Language, as a statement of the systematic relations of communicative events to each other, cannot be exclusively a "sentence affair." If we have not found supra-sentence structures, perhaps we simply have not looked hard enough. If phonemes can be conditioned by others in the immediate environment, why is it not possible that morphemes are conditioned by the other members of the noun phrase of which they are a part? Why cannot the noun phrase in turn be conditioned by the sentence? Why cannot the sentence be conditioned by the paragraph? The idea of conditioning is stretched by using it in this very broad sense, but maybe every decision relative to a given unit (phrase, sentence, etc.) is not made on a basis that is internal to that unit.

Since language users deal in connected discourse, surely an adequate description of the language does not stop at sentence boundaries. At this point, it is probably best if Mr. Gunter speakers for himself.

> The conclusions to be reached about contours in dialogue seem to me to be of two kinds: (a) the meaning of a contour does not arise solely from the sentence in which it figures, but from that sentence plus its context, though the contour is so intimate a part of the whole nexus of relationships between context and response that its meaning cannot be given apart from the meaning of the whole; and (b) the intonations that occur with the accent placement are much better considered as contours than as combinations of discreet, single 'phonemic' pitch levels [1966, p. 170].

Gunter showed how the contour of each sentence, with a few important exceptions, relates to that of the sentence preceding (see Figure 1). In

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Insert Figure 1 about here

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sentence 2, John and sports are accented--exemplifying Gunter's rule that new semantic information substituted in the same grammatical frame as that previously used is signaled with accents. In this case, the lack of accent on the word bought may be taken to signal its synonomy with the word acquired. In similar vein Gunter works his way through the dialogue and shows how successive intonation contours fit into an overall pattern. However, a particularly interesting sentence is number 7. Gunter professes to be able to find no connection between lines 6 and 7 that is marked by context grammar signals.

This lack of intonational connection should not be surprising. When we focus our attention on intonation contours or recursive embedding rules or word associations, and attempt to use any one of them to account for linguistic performance in all the situations in which they might be appropriate, we may be ignoring a very important characteristic of language users. Conversations with others and with ourselves seem to take on what might be called "semantic contours" for want of a better term. And these tend to be superordinate to sequences of intonation contours. Such a contour is evident in this dialogue. The enormous flexibility of the human being allows him to elect any one of several routes to his goal of adequate communication. Operating on a multi-systemic, compensatory basis, he shifts from the use of one part of his linguistic capacity to another and, in the process, he often leaves the theorist wondering why his carefully worked out concepts no longer seem to be applicable. In a very real sense they are applicable, but there are as yet undefined limits to their operation. In another sense, they may not be applicable at all times and in all places. The average native speaker of the language is supremely indifferent to the particular device he uses to communicate, so long as he does communicate. Considering the enormous complexity of even a single system of generative rules, it is frightening to think that we must also be alert to the possibility of the existence of some sort of meta-rules which dictate the choice of systems that are to be relied on most heavily at any given point. If these choices were purely idiosyncratic, we would not need to be concerned with them, but they seem to have communicative

value. Hence they must be shared and the explication of the various systems and the meta-rules, if indeed there be such, might well take linguistics far from its traditional haunts.

Just as there are many functionally equivalent routes in language production, there are many ways to sample incoming messages. Two examples should illustrate this point. The first is taken from a demonstration Harlan Lane used in a report of a study of phoneme boundaries. In this experiment he demonstrated that native English speakers can make absolute discriminations between the minimal pairs /do/ and /to/ entirely on the basis of the delay of onset of the second formant. If the delay was between 0 and 20 msec., the sound was always heard as /do/; at about 25 msec. delay there was an abrupt shift in identifications and Ss heard all longer delays as /to/. Here then is a single parameter that will enable us to discriminate between two English phonemes. What a beautiful thought. That nature can be so kind!

The unfortunate fact is that, while we can indeed discriminate /do/ from /to/ by using this one aspect of the difference between them, we can also perform the discrimination just as unambiguously and accurately by basing our judgments on any one of several other attributes, such as aspiration. In other words, we have at our disposal several ways of identifying /do/, and which one we use may well be determined by factors we now think of as completely irrelevant. But they may not be.

Another example on a more global scale may be helpful. A recent experiment (Koen, Becker, & Young, 1966) sought to determine the degree to which the paragraph as a structure could be considered psychologically "real"--in the sense that native English speakers could identify them and could agree on where they were, even with semantic cues severely restricted. To do this, some passages of expository prose were chosen. Paragraph identions were removed and all nouns, verbs, adjectives, and adverbs were replaced with nonsense words, retaining grammatically relevant word endings like -ed, -ing, and -ly. College student Ss were presented with the original, unindented, English passages and the derived nonsense passages and asked to mark the paragraphs as they saw them. The Ss showed a high degree of agreement with each other in placing paragraph markers, and they showed a strong tendency to place the markers at the same sentence junctures in both English and nonsense passages. It was concluded that there really is a paragraph, and while it

seems to be a conventional unit, it is not an arbitrary one. An interesting sidelight of the experiment was the number of different reasons which were given by the Ss for placing paragraph markers at the same sentence juncture. Here again, on a much more global scale than was the case in the /do/ - /to/ experiment is an instance of quite different stimuli eliciting the same response. But the Ss' verbalizations about their reasons for paragraphing are not the crucial evidence in the matter. It is not at all unusual for human beings to be able to perform highly complex tasks with great precision without being able to state clearly how they did it. Independent of our collection of data from native English speakers, structural analyses of the passages were performed using as a basis the Becker tagmemically derived theory of rhetoric (Becker, 1965). The domains of the various lexical, grammatical, and rhetorical elements in each passage were indicated. These consist of one or more sentences which share common markers, such as content words (in the lexical system), verb tense (grammatical system) or transition words (rhetorical system). The beginnings and endings of these elements were used to predict where Ss would place paragraph markers. While on the whole the rhetorical system appears to be the most accurate single predictor of paragraphing behavior, at particular points one of the other systems seemed to be more influential. The overall balance of cues from all three systems was the controlling factor; relatively few structural "breaks" in one system could be compensated for by many structural breaks in another.

The conclusion to be derived from these examples is that there is no one pattern of articulatory activity, or of physical output that will be recognized unequivocally as a given phoneme. And there is no simple set of markers that will always elicit a paragraph marker from Ss. In both cases there are a large number of cues, only a few of which, perhaps only one, are necessary for identification. But they are all used at one time or other. Furthermore, they are used in different patterns, and all these patterns seem to be functionally equivalent. There is a fascinating but difficult task awaiting the attempt to discover the conditions which lead us to the use of one set of cues rather than another. To the extent that behavior is shared by a sizable proportion of people, we cannot comfortably assume that it simply represents individual choices, and hence can be left to the ritualistic experimental activities of the psychologists.

What psychologists refer to as "functional equivalence of stimuli" in eliciting a given response is the same general domain that linguists are familiar with in terms of "allo-" forms of "-emic" units. In the semantic realm, it seems possible that paraphrases bear such "allo-" relationships to some basic sememic unit. But it must be recognized that when we reach this level of discourse, grammatical considerations begin to play a role. It is apparent, in multi-word utterances, that form and meaning are intimately related. At any rate, it seems reasonable to suggest that paraphrases may be "allo-" forms on two levels--semantic and syntactic.

One way to explore this question is to ask native English speakers to paraphrase sentences which have the same surface structure but different deep structures. Twenty-two college students were asked to write one paraphrase each to the sentences John is easy to please and Mary is ready to go. They were told that they could use the same words or not as they chose--just say "the same thing another way." There was no time limit and the original sentences were written on the blackboard. See Table 1 for the list of paraphrases that were produced to Mary is ready to go. In some cases the same sentence was given by

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Insert Table 1 about here

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more than one S; for example, No. 1 occurred four times. Incidentally, it appears that two Ss did not know the meaning of "paraphase"-- witness sentences Nos. 6 and 14. The data appears quite regular. Mary is both the logical and grammatical subject in the original sentence; likewise Mary is the subject of every paraphrase in both surface structure and deep structure. It is interesting to note that there is a fairly narrow range of surface structures. Eleven of the paraphrases include the string "nom + be + adj + prep + infinitival nominal," (sentences 1 - 7), which was the form of the original sentence. Six others (sentences 8, 9, 10, and 11) have the form "nom + modal + verb + x" and three have "nom + be + adj + x" (sentences 12 and 13). These three kinds of strings account for 19 of the 22 sentences.

Since these sentences were produced under instructions to "say the same thing another way" and since there was no question of time pressure or memory load, we may assume that we have here obtained a set of variations on a theme. Since the semantic relations among the productions seem fairly clear, perhaps

we have some "allo-" sememes. But maybe we have more than that. We also have some variations in form--some superficial phrase markers that appear to bear rather special relationships to each other by virtue of the conditions under which they were elicited. Is it possible that these paraphrases constitute a family or class, each element of which is an "allo-" form of some "-emic" entity? If so, it is probably wise to remember that they differ from each other along both semantic and syntactic dimensions. One inference derived from this line of thinking is that, just as we have lexical items which share privileges of occurrence and bear the relation of synonymity to each other, perhaps we also have syntactic structures which are, in some sense, "synonymous." Richard Gunter made a related point when he said:

> Thus a given sentence in English has a battery of forms, or guises, that it may assume. The full display of these forms may be called the paradigm of the sentence in question. One could posit a NEUTRAL FORM for each sentence, say, the statement phase in normal constituent order, with falling intonation and with the accent on the last nominal, and with no ellipsis for reference. Such a neutral form would serve as the name of the paradigm in question. It may be that such a form has deeper significance: it may be the only form of a sentence that neither has nor implies a context [1966, p. 1964].

The paraphrases of the other sentence, John is easy to please, are illustrated in Table 2. In the surface structure of the sentence, of course,

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Insert Table 2 about here

John is the subject of the sentence while in the deep structure John becomes the object of the verb "please." The question was: Would paraphrases of this sentence recognize the basic semantic and syntactic relationships in the sentence?' Apparently they do--but in an interesting way. The surface structures of 12 of the 22 paraphrases make John the object of the verb (sentences 1 - 7). The remainder of the sentences do other things, however. For example, sentence 8, which seems a little peculiar, but comprehensible, retains John as the grammatical subject with an active verb: sentence 9 essentially repeats the structure of the original sentence--with the addition of two negatives, one grammatical and one semantic: three others (sentences 10, 11, and 12) keep John as the subject, but use the passive voice, apparently responding to John's position in the deep structure. Two others, however, sentences 13 and 14, place John as the subject in a "nom +

verb + pred" string, which departs entirely from the deep structure of the sentences produced by the other 19 people--all of which make John the object of the verb in the underlying phrase marker. We can make the same comments as we made previously about "variations on a combined semantic-syntactic theme" as regards the other 12 paraphrases, but these two invite additional speculation.

These results lead to the following suggestions. First, it seems that the Ss who wrote sentences 9, 10, 12, and 13 treated the phrase "easy to please" in the original sentence almost as though it were a predicate adjective. It may be speculated that these Ss were taking the phrase as attributive of John, in some sense, equating "is agreeable" with "is easily satisfied" and "is easy to please," because they all describe "states of John." So, here is another instance of combined semantic-syntactic change--still seen as constituting a member of a class of equivalent utterances. Second, it seems that Ss, in their paraphrases of this sentence (John is easy to please) are in some obscure way reacting to a semantic-syntactic conflict because, to me at least, John is the logical (semantic) subject of the sentence--even in the deep structure--where he becomes the grammatical object. Note that John is the grammatical subject in the surface phrase marker in only 10 of the 22 paraphrases, in contradistinction to the fact that Mary was the subject in every superficial phrase marker produced as a paraphrase of Mary is ready to go.

Here again, we have a set of sentences which bear special relations to each other. Theoretically, many sentence forms could be derived from these same basic structures, and could be considered semantically as equivalents, but in point of fact when Ss are asked to paraphrase these sentences, only a few different kinds show up.

There is one more part of this experiment that has not yet been carried out. It is proposed to present these two lists of paraphrases to another group of college students and ask each of them to write down the one simple sentence which seems best to summarize each group. It is expected that John is easy to please and Mary is ready to go will be produced by a large percentage of them. If it comes out that way, it will strengthen the hunch that the different ways of saying "the same thing" may indeed result in a relatively small class of variations that have characteristic semantic and syntactic properties and that this behavior is not idiosyncratic but conventional.

In summary then, it appears that what psychology knows about thinking, rule formation, and productivity is, in general, congruent with what linguistics

knows about the universal features of natural languages. We have taken a brief look at the human capacity for selecting aspects and dimensions of the real world to which to respond, and for changing from one aspect to another in response to large-scale stimulus patterns which have not yet been adequately studied. Some evidence was cited that appears to support the idea that the application of this behavioral concept to language functioning leads to the speculation that the phonological, semantic and grammatical domains of language interact and substitute for each other in the control of linguistic responses.

Footnotes

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[2]The research reported herein was performed pursuant to Contract OEC-3-6-061784-0508 with the U. S. Department of Health, Education, and Welfare, Office of Education, under the provisions of P. L. 83-531, Cooperative Research, and the provisions of Title VI, P. L. 85-864, as amended. This research report is one of several which have been submitted to the Office of Education as *Studies in language and language behavior*, Progress Report V, September 1, 1967.

Becker, A. L. A tagmemic approach to paragraph analysis. *College Composition and Communication*, 1965, *16*, 237-242.

Gunter, R. On the placement of accent in dialogue. *Journal of Linguistics*, 1966, *2*, 159-179.

Halle, M. Phonology in generative grammar. *Word*, 1962, *18*, 54-72.

Hockett, C. F. The problem of universals in language. In J. H. Greenberg (Ed.), *Universals of language*. Cambridge: M.I.T. Press, 1963. Pp. 1-22.

Jesperson, O. The system of grammar. London: Allen & Unwin, 1933.

Koen, F., Becker, A., & Young, R. The psychological reality of the paragraph. Paper delivered at Conference on Language and Language Behavior, CRLLB, Ann Arbor, Michigan, October 17-18, 1966.

Lane, H. L. Identification, discrimination, translation: The effects of mapping ranges of physical continua onto phoneme and sememe categories. IRAL, 1966, *4*, 215-226.

Miller, G. A. The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 1956, *63*, 81-96.

Stolz, W. An investigation of linguistic productivity through the comprehension of self-embedded sentences. Mimeographed, 1965.

Figure 1

Dialogue from Gunter, 1966

1. Smith: Bob has acquired a MOtor-cycle.
2. Jones: JOHN has bought a SPORTS car.
3. Smith: Where did he GET it?
4. Jones: He bought it in the CIty.
5. Smith: Did he drive it HOME?
6. Jones: PAUL drove it home.
7. Smith: I hope the TRAFfic wasn't bad.

Table 1

Paraphrases of

MARY IS READY TO GO

		Number
1.	Mary is prepared to leave	4
2.	Mary is equipped to leave	1
3.	Mary is prepared to sally forth	1
4.	Mary's all set to leave	2
5.	Mary is all set to go	1
6.	Ready to go is Mary	1
7.	Mary's set to go	1
8.	Mary can leave now	3
9.	Mary would like to leave now	1
10.	Mary can go at any time	1
11.	Mary is waiting to leave	1
12.	Mary is ready	2
13.	If you want to leave, Mary is ready	1
14.	Is Mary read to go?	1
15.	Mary has prepared herself so that she can leave anytime.	1
		22

Table 2

Paraphrases of

JOHN IS EASY TO PLEASE

		Number
1.	It is easy to please John	5
2.	It's no trouble to satisfy John	1
3.	It is not at all difficult to make John happy	2
4.	To please John requires very little	1
5.	It is not difficult to satisfy John	1
6.	To please John is easy	1
7.	Anything can please John easily	1
8.	John pleases easily	2
9.	John isn't hard to please	1
10.	John is easily pleased	2
11.	John can be pleased easily	1
12.	John is easily satisfied	1
13.	John is agreeable	2
14.	John has a good disposition	1
		22

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